United States Steel Corporation
Clairton Works
400 State Street
Clairton, PA 15025

September 5, 2007

Mr. Charles Zadakis, Chief
Pennsylvania Department of
Environmental Protection
400 Market Street, 12th Floor
Harrisburg, PA 17105-8468

Ms. Linda Miller, 3 AP 11
US Environmental Protection
Agency, Region III
1650 Arch Street
Philadelphia, PA 19103

Subject: United States Steel Corporation Clairton Coke Works
NOx CEMS 0060510 B Battery
Part 60 and Part 75 RATA Test

Enclosed with this letter is the report of the results of the annual Relative Accuracy Test Audit (RATA) of the continuous emissions monitoring systems (CEMS) conducted at B Battery on August 17, 2007.

If you have any questions on this report, please direct them to me at 412-233-1015 or by email at cdavis@uss.com.

Sincerely,

Coleen M. Davis
Senior Environmental Control Engineer

cc: S. Hepler, PaDEP Pittsburgh
S. Etzel, ACHD
M. E. Hohman (w/o attachments)
T. Woodwell (w/o attachments)
M. Jeffrey (w/o attachements)

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UNITED STATES STEEL CORPORATION
MON VALLEY COMPLEX - CLAIRTON PLANT
CLAIRTON, PENNSYLVANIA

Relative Accuracy Test Audit
of the Continuous Emissions Monitoring System
for B-Battery Combustion Stack at
United States Steel Corporation
Mon Valley Complex - Clairton Plant – Clairton, PA
per
Pennsylvania Department of Environmental Protection
Continuous Source Monitoring Manual Requirements
August 17, 2007

AUGUST 2007

CHESTER ENGINEERS

"Tradition in Engineering Excellence Since 1910"

United States Steel Corporation
Mon Valley Complex - Clairton Plant
Clairton, Pennsylvania

Relative Accuracy Test Audit of the Continuous Emissions Monitoring System for B-Battery Combustion Stack at United States Steel Corporation – Mon Valley Complex - Clairton Plant – Clairton, PA – per Pennsylvania Department of Environmental Protection – Continuous Source Monitoring Manual Requirements - August 17, 2007

August 2007

Prepared by: Daniel A. Nadzam, P.E.

Approved by: Robinson P. Khosah, Ph.D.

Project No.: 07-6296-MW-PG50, Task 085

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TABLE OF CONTENTS

Page No.

LIST OF FIGURES

LIST OF TABLES

APPENDICES

CERTIFICATION

The following certification has been prepared in accordance with the requirements of the Pennsylvania Department of Environmental Protection (PaDEP) Source Testing Manual (Revision 3.3, November 2000), Section 2.1.2.6:

To the best of my knowledge, this source test report has been checked for completeness and the results presented herein are accurate, error-free, legible and representative of the actual emissions measured during the testing.

Daniel A. Nadzam, P.E.
Engineer II

August 29, 2007
Date

EXECUTIVE SUMMARY

United States Steel Corporation (U.S. Steel) operates twelve metallurgical coke batteries at their Mon Valley Complex - Clairton Plant facility located in Clairton, Pennsylvania. Coke oven gas (COG) is used as the underfiring fuel for each of the batteries. The products of combustion from each underfiring system are exhausted to the atmosphere through a single exhaust stack.

At B-Battery Combustion Stack, concentrations of nitrogen oxides (NO_x) and oxygen (O_2) in the flue gas stream are monitored and recorded on a continuous basis using a continuous emissions monitoring system (CEMS). The CEMS consists of a NO_x analyzer, an O_2 analyzer and a data acquisition system. In accordance with the requirements of the Pennsylvania Department of Environmental Protection (PA DEP) Continuous Source Monitoring Manual (Revision No. 8, December 2006), a relative accuracy test audit (RATA) of the U.S. Steel B-Battery Combustion Stack CEMS was conducted on August 17, 2007. In summary, the RATA consisted of nine 21-minute comparison test runs. For each test run, the concentrations of NO_x and O_2 in the B-Battery Combustion Stack gas stream were measured by the U.S. Steel CEMS and instrumentation provided and operated by Chester Engineers. The test results for the nine test runs at B-Battery Combustion Stack were examined and a series of statistical measures were generated to determine if the CEMS passed the RATA. The results showed that the U.S. Steel B-Battery Combustion Stack NO_x CEMS passed the applicable RATA criteria.

1.0 INTRODUCTION

1.1 Summary of the Test Program

United States Steel Corporation (U.S. Steel) operates twelve metallurgical coke batteries at their Mon Valley Complex - Clairton Plant facility located in Clairton, Pennsylvania. Coke oven gas (COG) is used as the underfiring fuel for each of the batteries. The products of combustion from each underfiring system are exhausted to the atmosphere through a single exhaust stack.

At B-Battery Combustion Stack, concentrations of nitrogen oxides (NO_x) and oxygen (O_2) in the flue gas stream are monitored and recorded on a continuous basis using a continuous emissions monitoring system (CEMS). The CEMS consists of a NO_x analyzer, an O_2 analyzer and a data acquisition system. Oxygen concentrations are reported in units of percent by volume, dry basis (%). Nitrogen oxide emissions are reported in units of pounds per million British Thermal Units of heat input (lb/MMBtu). NO_x emissions in units of lb/MMBtu are calculated from the knowledge of the NO_x concentration in the flue gas stream, the oxygen concentration in the flue gas stream and the F-factor of the fuel. The F-factor, defined as the ratio of the volume of combustion gas products produced to the thermal input of the fuel gas, is calculated from the knowledge of the fuel gas composition. U.S. Steel monitors and records the composition of the COG on a routine basis using gas chromatographic techniques. Based on historical data, U.S. Steel has determined that the COG composition remains nearly steady, and as such, U.S. Steel uses a constant F-factor value of 7725 dscf / MMBtu in their data acquisition system.

In accordance with the requirements of the Pennsylvania Department of Environmental Protection (PaDEP) Continuous Source Monitoring Manual (Revision No. 8, December 2006), a relative accuracy test audit (RATA) of the U.S. Steel B-Battery Combustion Stack CEMS was conducted on August 17, 2007. In summary, the RATA consisted of nine 21-minute comparison test runs. For each test run, the concentrations of NO_x and O_2 in the B-Battery Combustion Stack gas stream were measured. As mentioned previously, U.S. Steel monitors and records the composition of the COG on a routine basis, and as such, U.S. Steel provided Chester Engineers

(Chester) with two COG analyses for the B-Battery Combustion Stack RATA. Each analysis was used to calculate an F-factor. The average value of the two F-factors was used by Chester to calculate the NO_x emissions in units of lb/MMBtu. The test results for the nine test runs at B-Battery Combustion Stack were examined and a series of statistical measures were generated to determine if the CEMS passed the RATA. Chester was contracted by U.S. Steel (host site) to conduct the RATA.

1.2 Key Personnel

Contact information for the key personnel who coordinated this test program is listed below:

NAME AND TITLE	AFFILIATION AND MAILING ADDRESS	ASSIGNMENT	TELEPHONE NO. & E-MAIL ADDRESS
Coleen M. Davis Sr. Environmental Engineer	United States Steel Corporation Mon Valley Complex Clairton Plant 400 State Street Clairton, PA 15025	Facility Owner / Operator Representative	(412) 233-1015 cdavis@uss.com
Gary S. Swaoger Research Analyst, Technical Services	United States Steel Corporation Mon Valley Complex Clairton Plant 400 State Street Clairton, PA 15025	Facility Owner / Operator Representative	(412) 233-1423 gswaoger@ uss.com
Daniel A. Nadzam, P.E. Engineer II	Chester Engineers 260 Airside Drive Moon Township, PA 15108	Air Emissions Testing Representative	(412) 809-6600 dnadzam@ chesterengineers.com

The PaDEP has assigned Environmental Laboratory Registration No. 02-1193 to Chester.

2.0 SUMMARY OF THE TEST RESULTS

2.1 RATA Criteria

The criteria for determining if the CEMS passed the RATA are as follows:

For NO_x, one of the following two criteria must be satisfied (reference: PaDEP Continuous Source Monitoring Manual, Table II, telephone conversation between Mr. Charles J. Zadakis of the PaDEP and Mr. John Shimshock of Chester on December 16, 1999 and subsequent facsimile transmission from Mr. Zadakis):

- RA – 1 = {Abs (d) + Abs (CC)} / ARM <= 20%; or
- RA – 4 = Average Absolute Arithmetic Difference <= 0.02 lb/MMBtu

where

RA – 1 = Relative Accuracy – Criterion No. 1

RA – 4 = Relative Accuracy – Criterion No. 4 (numbering sequence per Mr. Zadakis)

RM = Reference Method – data generated by Chester

d = Average difference between the NO_x emissions (RM) and NO_x emissions (U.S. Steel) as calculated from the nine comparison test runs

Abs (d) = Absolute value of d

CC = Confidence coefficient = 2.306 * Sd / ($9^{0.5}$) (for nine comparison test runs)

Sd = Sample standard deviation of the sample set consisting of the differences between the NO_x emissions (RM) and NO_x emissions (U.S. Steel) as calculated from the nine comparison test runs

Abs (CC) = Absolute value of CC

ARM = Average RM NO_x emissions value (lb/MMBtu) as calculated from the nine comparison test runs

The Average Absolute Arithmetic Difference is computed by (i) calculating the absolute differences between the NOx emissions (RM) and NOx emissions (U.S. Steel) from the nine comparison test runs and (ii) calculating the average of the nine absolute differences.

2.2 B-Battery Combustion Stack

The NO_x RATA results for B-Battery exhaust stack have been summarized in Table 1. The results presented in Table 1 show that both RATA criteria were satisfied for the NO_x CEMS.

3.0 TEST METHODOLOGIES

3.1 U.S. Steel CEMS

Detailed information pertaining to the U.S. Steel CEMS was submitted in their Phase I application to the PaDEP in 1994. For the RATA, U.S. Steel provided one-minute and the applicable 21-minute averages of their CEMS data to Chester. Copies of the applicable U.S. Steel CEMS data for B-Battery Combustion Stack can be found in Appendix A.

3.2 Reference Methods Used by Chester

The RATA was conducted in accordance with the pre-test procedural protocol submitted to the PaDEP in June 2007 entitled "Pre-Test Procedural Protocol for the Relative Accuracy Test Audit of the Continuous Emissions Monitoring Systems at United States Steel Corporation – Mon Valley Complex – Clairton Plant – B-Battery - per Pennsylvania Department of Environmental Protection – Continuous Source Monitoring Manual and Code of Federal Regulations, Title 40, Part 75 (Continuous Emission Monitoring) Requirements." A copy of the PaDEP's protocol acceptance letter can be found in Appendix A. It should be noted that the protocol was incorrectly titled (this source is regulated under Part 60, not Part 75). The following U.S. EPA reference test methodologies were used by Chester to conduct the RATA:

Reference Code of Federal Regulations, Title 40, Part 60, Appendix A -

Method 3A – Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (Instrumental Analyzer Procedure)
Method 7E – Determination of nitrogen oxides emissions from stationary sources (Instrumental Analyzer Procedure)

Reference Code of Federal Regulations, Title 40, Part 60, Appendix B -

Performance Specification 2 – Specifications and test procedures for SO_2 and NO_x continuous emissions monitoring systems in stationary sources
Performance Specification 3 – Specifications and test procedures for O_2 and CO_2 continuous emissions monitoring systems in stationary sources

U.S. Steel performed the analyses of collected gaseous fuel samples. Details of the reference methods used by Chester are presented in the following sections.

3.2.1 Gaseous Fuel Analysis and F-Factor Calculation

Two grab samples of the fuel gas used at B-Battery were collected in Tedlar bags. U.S. Steel analyzed the gas samples for the predominant constituents using gas chromatography with flame ionization and thermal conductivity detection techniques. The analytical results of the two fuel gas samples used at B-Battery can be found in Appendix A. Based upon each analysis, an F-factor was calculated. The F-factor calculations are presented in Appendix A as Tables A1 and A2. The average value (7598 dscf / MMBtu) of the two F-factors was used by Chester to calculate the NO_x emissions in units of lb/MMBtu.

3.2.2 Location of Traverse Points

A schematic of B-Battery Combustion Stack is presented in Figure 1. Four test ports at 90 degrees separation in the same horizontal plane are installed on the stack. The internal stack diameter at the test platform level is 13 feet (156 inches). The test ports are located approximately 75 feet (5.8 duct diameters) downstream of the nearest duct disturbance and approximately 175 feet (13.5 duct diameters) from the top of the stack. The upstream and downstream distances satisfied the U.S. EPA reference method criteria for test port locations. All process gas measurements were conducted using the test ports installed on the exhaust stack.

A stratification test was conducted on August 17, 2007 at B-Battery Combustion Stack to determine the number and location of the sampling points. The stratification test was conducted in accordance with the requirements promulgated in 40 CFR 75 Appendix A, Section 6.5.6. The stratification test was conducted under the most steady-state conditions possible so as not to measure process related concentration variations. NO_x and O_2 concentrations were measured for two consecutive minutes at each of three traverse points (as shown in Figure 1) located through a single test port. The average NO_x and O_2 concentration at each traverse point was calculated. The average NO_x and O_2 concentration for all three traverse points was also calculated (identified as $(NO_x)_{avg}$ and $(O_2)_{avg}$, respectively). The number and location of the sampling points for the RATA was determined based on results of each stratification test as outlined below:

PARAMETERS	CRITERIA AT ALL TRAVERSE POINTS	NUMBER AND LOCATION OF SAMPLING POINTS
NO_x and O_2	NO_x concentration within +/- 5% or +/- 3 ppmv of $(NO_x)_{avg}$ and O_2 concentration within +/- 5% (percentage basis) or +/- 0.3% (absolute basis) of $(O_2)_{avg}$	1 Sampling Point located at least 1 meter from the stack wall (21 minutes of sampling per point per test run)
NO_x and O_2	All other conditions	3 Sampling Points located 16.7%, 50.0% and 83.3% of the way across the stack (7 minutes of sampling per point per test run)

The results of the stratification test as presented in Appendix B satisfied the single sampling point (located at least 1 meter from the stack wall) requirements for both NO_x and O_2.

3.2.3 Oxygen Concentration

Oxygen concentrations were measured on a dry basis (units of percent by volume, %) using CEM techniques in accordance with U.S. EPA Reference Method 3A. Measurements were conducted by means of a gas extraction and conditioning system. Conditioning of the sample gas was accomplished by pulling it from the stack through a heated stainless steel probe and in-stack glass fiber filter. The filtered gas was routed through 100 feet of heated Teflon line to Chester's mobile CEM laboratory located nearby. The heated line temperature was maintained at 248 +/- 25^0F to prevent condensation from occurring in the sample line. A portion of the gas stream was split from the main sample gas stream in the CEM laboratory and treated to remove moisture by a non-contact refrigerative method such that the dew point of the treated sample gas was 40^0F or lower. The dry sample was then pumped, manifolded and routed to a Model 100P California Analytical Instruments, Inc. Paramagnetic Oxygen Analyzer, operating on a range of 0 to 21.9 percent, by volume, dry basis. Sample gas flow not delivered to the analyzer was sufficient to allow a bypass stream that minimized sample residence time.

A three-point calibration of the oxygen analyzer was conducted at the beginning of the test day using U.S. EPA Protocol No. 1 gas standards. A sampling system bias check was conducted immediately before and after each RATA test run using the zero and mid-point calibration gas standards. The average oxygen concentration measured during each RATA test run was corrected for the analyzer and bias drifts in accordance with U.S. EPA Reference Method 3A. For the bias checks, the calibration gases were introduced through a three-way valve that was installed immediately downstream of the in-stack filter holder. Data recording was accomplished with the use of a computer based, automated digital data acquisition system. The U.S. Steel data acquisition clock (kept on Eastern Standard Time) was found to be 58 minutes behind Chester's data acquisition clock. Oxygen concentrations were scanned at five-second intervals. The scanned values were averaged every minute, displayed on a system monitor and recorded on magnetic storage media. The Chester reference method comparison data can be found in Appendix B.

3.2.4 Nitrogen Oxides Emissions

Nitrogen oxide concentrations were measured on a dry basis (units of parts per million by volume, ppmv) using CEM techniques in accordance with U.S. EPA Reference Method 7E. The gas extraction and conditioning system, calibration procedures and data recording mechanism were the same as described in Section 3.2.3. A Model 200AH Advanced Pollution Instrumentation, Inc. Chemiluminescent NO_x Analyzer, operating on a range of 0 to 451 ppmv, dry basis, was used. NO_x emissions in units of lb/MMBtu were calculated using the following formula:

NO_x emissions (lb/MMBtu) =
NO_x concentration (ppmv) * Fd * 1.194 * 10^{-7} * 20.9 / {20.9 – O_2 concentration (%)}

Appendix B contains the results of the most recent (i) NO_x analyzer interference response test and (ii) NO_2 to NO conversion efficiency test.

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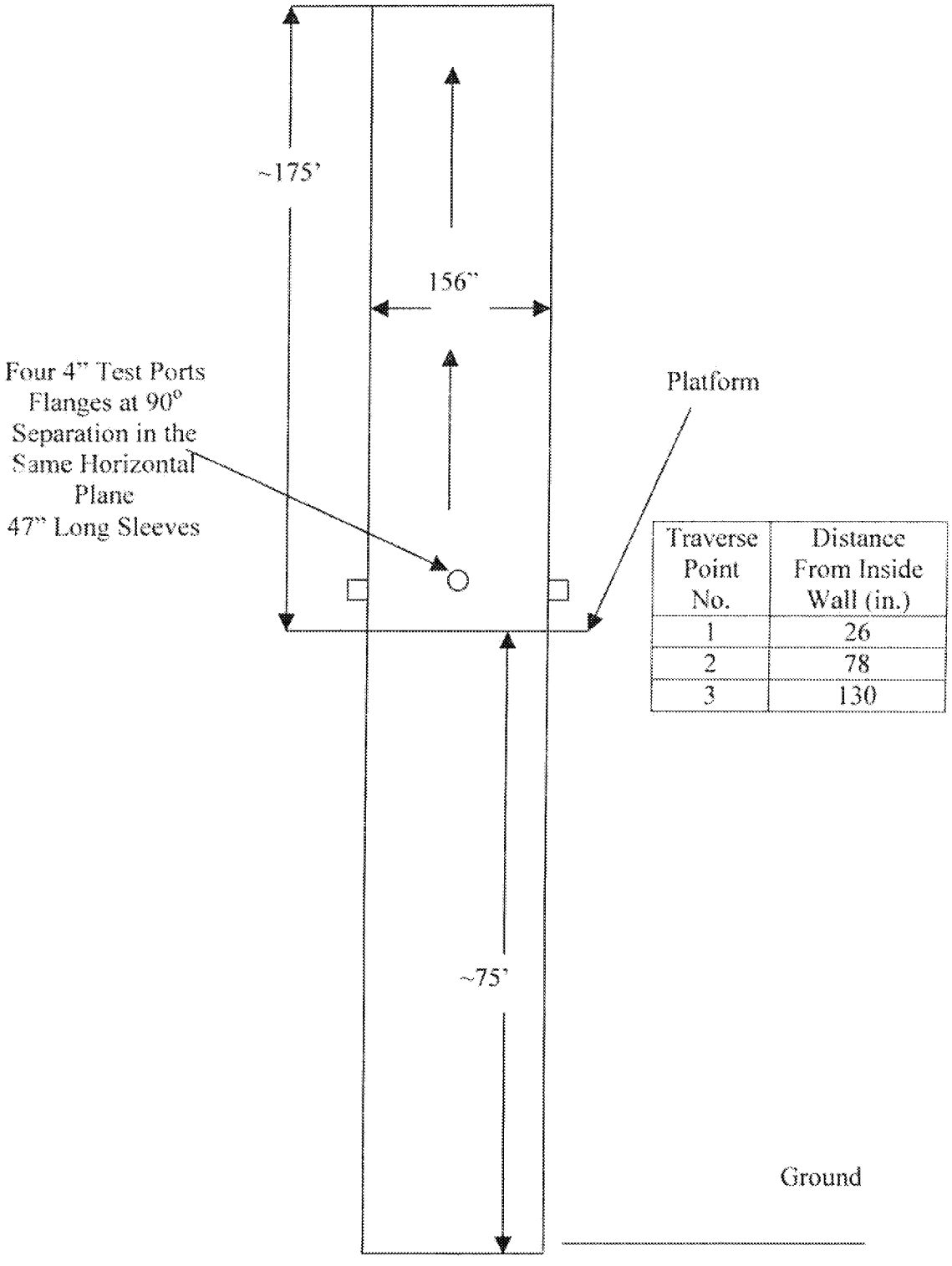
CLAIRTON PLANT
CLAIRTON, PENNSYLVANIA

FIGURE 1

SCHEMATIC OF B-BATTERY COMBUSTION STACK, TEST PORTS AND TRAVERSE POINTS



Traverse Point No.	Distance From Inside Wall (in.)
1	26
2	78
3	130

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MON VALLEY COMPLEX - CLAIRTON PLANT
CLAIRTON, PENNSYLVANIA

TABLE 1

B-BATTERY COMBUSTION STACK
NO_x CEM ANNUAL RATA RESULTS
AUGUST 17, 2007

All Test Runs

Test Run No.	Test Date	Start Time (EDT)	Stop Time (EDT)	RM Test Run Avg. NOx (lb/MMBtu)	USS CEM Test Run Avg. NOx (lb/MMBtu)	Arithmetic Difference (lb/MMBtu)
1	08/17/07	8:35	8:55	0.351	0.352	-0.001
2	08/17/07	9:09	9:29	0.354	0.349	0.005
3	08/17/07	9:44	10:04	0.320	0.319	0.001
4	08/17/07	10:17	10:37	0.304	0.306	-0.002
5	08/17/07	10:50	11:10	0.303	0.303	0.000
6	08/17/07	11:22	11:42	0.341	0.335	0.006
7	08/17/07	11:54	12:14	0.353	0.346	0.007
8	08/17/07	12:26	12:46	0.326	0.319	0.007
9	08/17/07	12:59	13:19	0.308	0.307	0.001

Results:				
		Data Points (n)		9
		Arithmetic Mean Difference (d)		0.003
		Standard Deviation (Sd)		0.003
		Confidence Coefficient (CC)		0.003
		Average RM Value (ARM)		0.329
		Relative Accuracy (RA - 1)	passed	1.6% < = 20%
	or	Relative Accuracy (RA - 4)	passed	0.003 < = 0.02

Notes:

RM = Reference Method
USS CEM = U.S. Steel Clairton Plant's Continuous Emission Monitor
CC = (t value) x (Sd / n^0.5) where t value = 2.306 for n = 9
RA - 1 = (Abs(d) + Abs(CC)) / ARM
RA - 4 = Average Absolute Arithmetic Difference
ATS Clock= USS Clock + 1 hour

Calculations according to U.S. EPA Performance Specification 2 and
PA DEP Continuous Source Monitoring Manual (Revision No. 8), Table II